

JOINT TUFTS/MIT COSMOLOGY SEMINAR

Three-body Encounters with Primordial Black Holes

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Stellar binaries have historically provided a rich target in the search for exotic compact objects such as primordial black holes (PBHs) or MACHOs. In a three-body interaction involving a PBH and a binary star system, the binary can either lose or gain a significant amount of energy from the PBH, leading to a change in its orbital period. We show that a few fast-moving perturbers can leave stochastic perturbations in systems that are measured with great precision. This opens a new class of dynamical probes with potential applications to asteroid-mass DM candidates. PBHs could also participate in exchange processes, in which one component of a binary system is ejected and replaced by the black hole itself. We study the rate of exchange processes and find that many such PBH binaries plausibly exist in the Solar neighborhood, and show that this process can account for observed binary systems whose properties run counter to the predictions of isolated binary evolution.

Tuesday, October 14, 2025, 2:30 pm

574 Boston Ave, Room 316

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Refreshments at 2:00 outside room 304